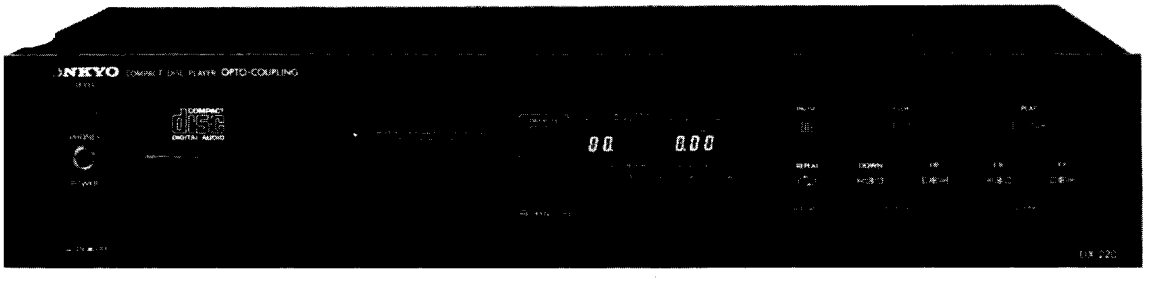
SERIAL NO. 3242

ONKYO SERVICE MANUAL

COMPACT DISC PLAYER
MODEL DX-220



Black and Silver models

BUDN, BUD	120V AC, 60Hz
BUG, UG	220V AC, 50Hz
BUW, BUWX, UW	120/220V AC, 50/60Hz
BUQA, BUQB	240V AC, 50Hz

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK ⚠ ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTS WHOSE PARTS NUMBERS APPEAR AS SHOWN IN THIS MANUAL.

MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

SPECIFICATIONS

Signal readout system:	Optical non-contact
Reading rotation:	About 500~200 r.p.m. (constant linear velocity)
Linear velocity:	1.2~1.4m/s
Error correction system:	Cross interleave readsolomon code
Decoded bits:	16 bits linear
Sampling frequency:	88.2kHz (two-times oversampling)
Number of channels:	2 (Stereo)
Frequency response:	5Hz~20kHz
Total harmonic distortion:	0.004% (at 1kHz)
Dynamic range:	93dB
Signal to noise ratio:	96dB
Channel separation:	90dB (at 1kHz)
Wow and Flutter:	Below threshold of measurability
Power comsumption:	12 watts
Output level:	2 volts r.m.s.
Dimensions (W x H x D):	435 x 88 x 357mm 17-1/8" x 3-7/16" x 14-1/16"
Weight:	4.8kg, 10.6lbs.

Specifications are subject to change without notice.

ONKYO
AUDIO COMPONENTS

PROTECTION OF EYES FROM LASER BEAM DURING SERVICING

This set employs a laser. Therefore, be sure to follow carefully the instructions below when servicing.

WARNING!!

WHEN SERVICING, DO NOT APPROACH THE LASER EXIT WITH THE EYE TOO CLOSELY. IN CASE IT IS NECESSARY TO CONFIRM LASER BEAM EMMISION, BE SURE TO OBSERVE FROM A DISTANCE OF MORE THAN 30cm FROM THE SURFACE OF THE OBJECTIVE LENS ON THE OPTICAL PICK-UP BLOCK.

Laer Diode Properties

- Material: GaAS/GaAlAs
- Wavelength: 780nm
- Emission Duration: continuous
- Laser output: max. 0.4mW*

*This output is the value measured at a distance about 1.8mm from the objective lens surface on the Optical Pick-up Block.

LASER WARNING LABELS

The labels shown below are affixed.

1. Warning labels

120V model

DANGER — INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCK FAILED OR DEFEATED. AVOID DIRECT EXPOSURE TO BEAM.

CAUTION — HAZARDOUS LASER AND ELECTROMAGBETIC RADIATION WHEN OPEN AND INTERLOCK DEFEATED.

ATTENTION — RAYONNEMENT LASER ET ELECTROMAGNETIQUE DANGEREUX SI OUVERT AVEC L'ENCLENCHEMENT DE SECURITE ANNULE.

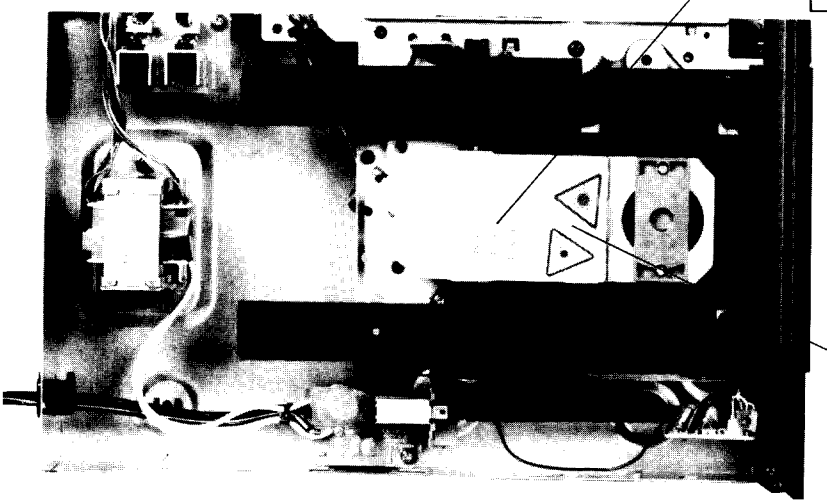


Photo 1

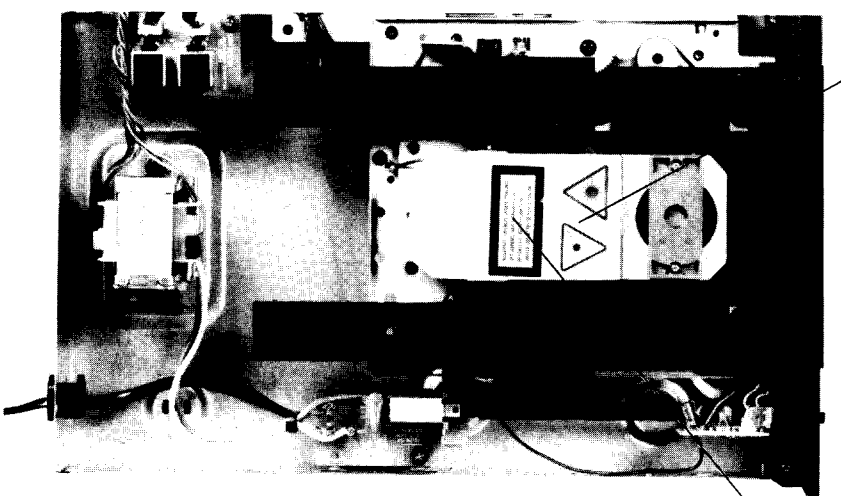
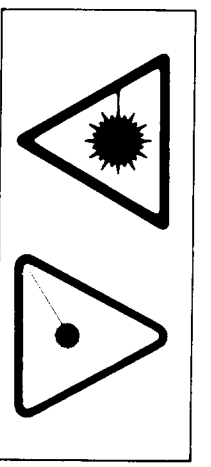


Photo 2



ADVARSEL: USYNLIG LASERSTRÅLING VED ÅBNING, NÅR SIKKERHEDSAFBRYDER ER UDE AF FUNKTION. UNDGÅ UDSÆTTELSE FOR STRÅLING.

2. Certification label (UD: 120V) model

This label is located on the back panel.

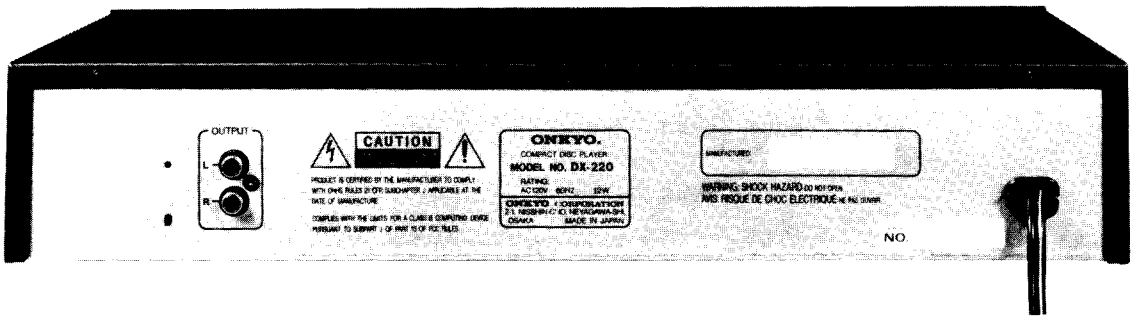


Photo 3

3. Class 1 label (Other models)

This label is located on the back panel.

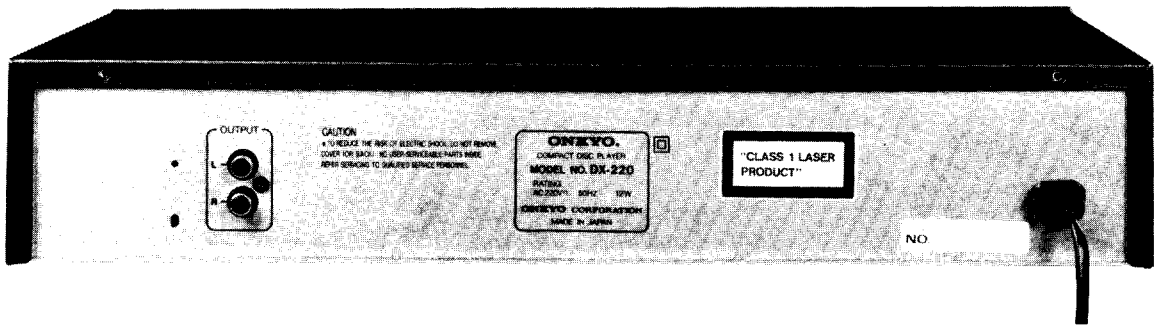
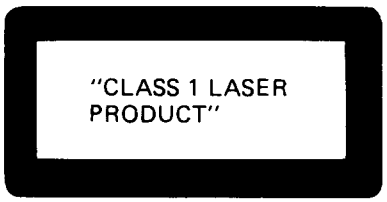


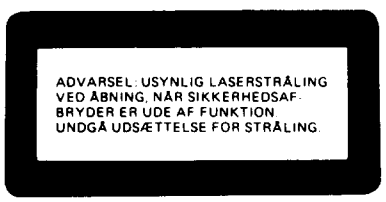
Photo 4

ADVARSEL



Denne mærkning er anbragt på apparatets højre side og indikerer, at apparatet arbejder med laserstråler af klasse 1, hvilket betyder, at der anvendes laserstråler af svageste klasse, og at man ikke på apparatets yderside kan blive udsat for utilladelig kraftig stråling.

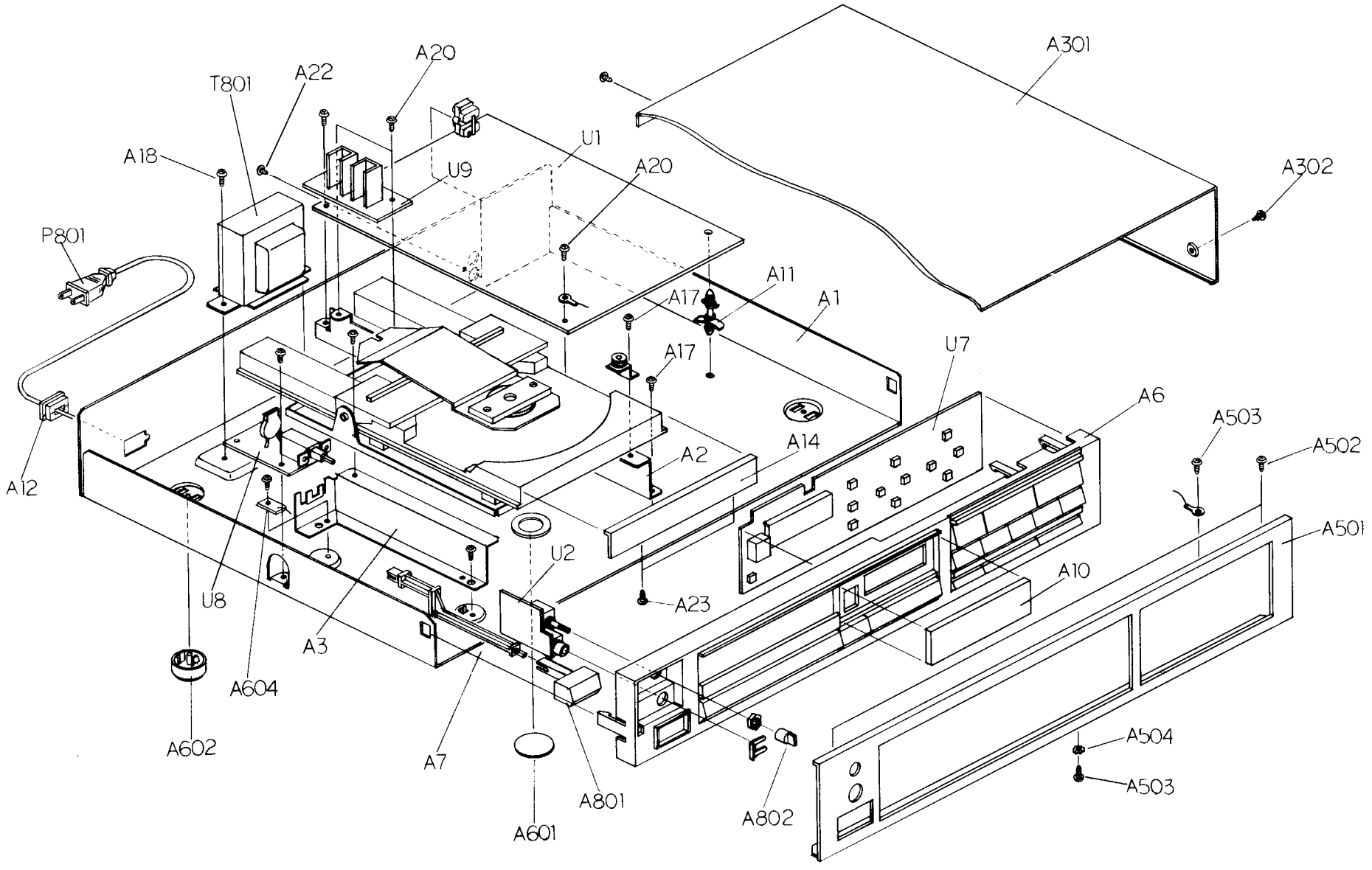
APPARATET BØR KUN ÅBNES AF FAGFOLK MED SÆRLIGT KENDSKAB TIL APPARATER MED LASERSTRÅLER!



Indvendigt i apparatet er anbragt den her gengivne advarselsmærkning, som advarer imod at foretage sådanne indgreb i apparatet, at man kan komme til at udsætte sig for laserstråling.

Fig. 10

EXPLODED VIEW



PARTS LIST

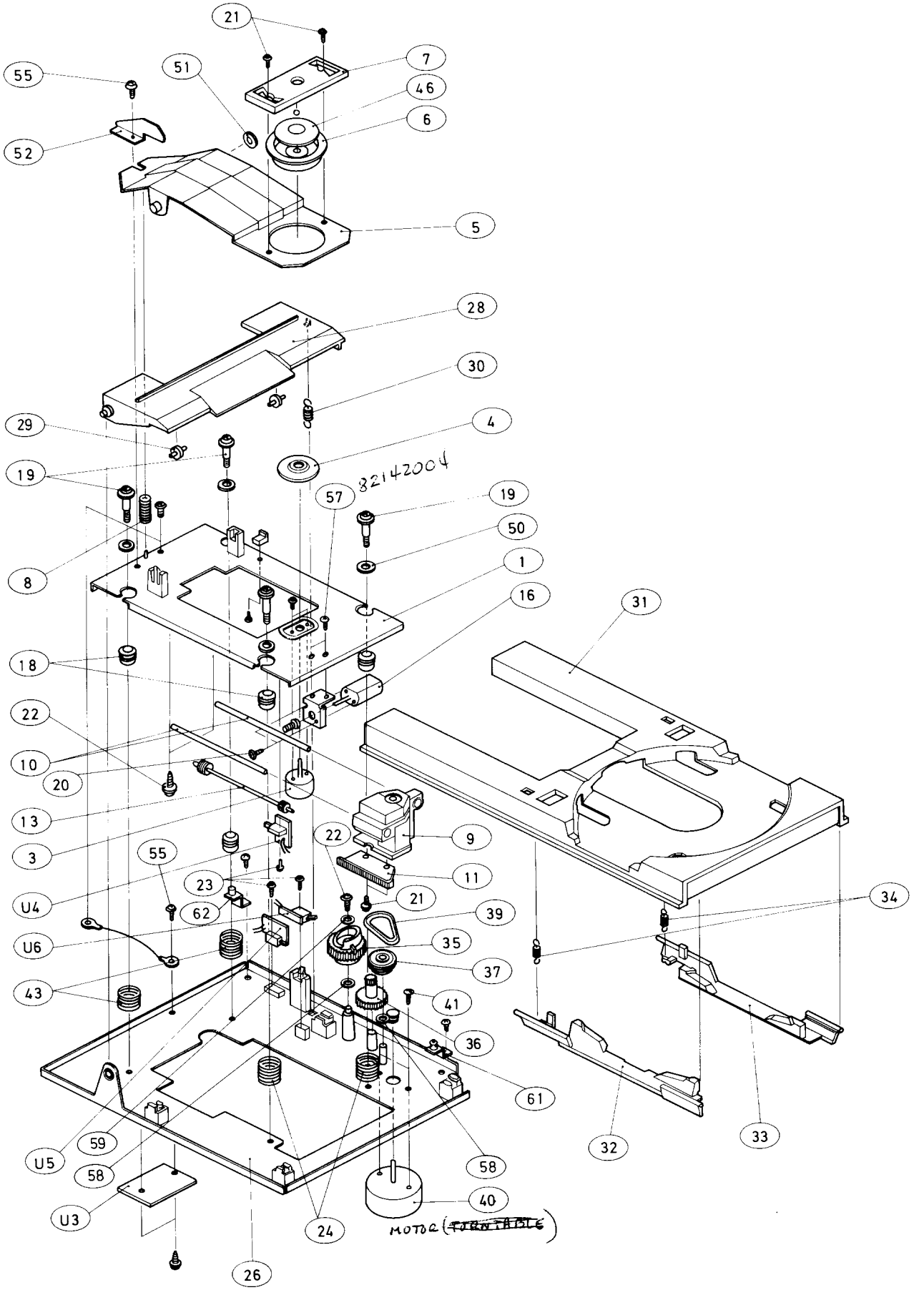
REF. NO.	PART NO.	DESCRIPTION
A1	27100097A	Chassis [D] 15.80
	27100100A	Chassis [G]
	27100102A	Chassis [W]
	27100112	Chassis [WX]
	27100106	Chassis [Q]
A2	27130441	Bracket R
A3	27130442	Bracket L
A6	27110293	Front bracket ass'y [S]
	27110294	Front bracket ass'y [B]
A7	27273054	Joint
A10	28191359	Clear plate
A11	27190011	Holder
A12	27300750	⚠ Strainrelief
A14	27210738A	Tray panel
A17	834430068	3TTS+6B(BC), Tapping screw
A18	830440089	4TTC+8C(BC), Tapping screw
A19	834230108	3TTS+10B(Ni), Nickel screw
A20	831130088	3TTW+8B, Tapping screw
A22	834430108	3TTS+10B(BC), Tapping screw
A23	834430080	3TTP+8P(BC), Tapping screw
A301	28184323	Top cover [S]
	28184324	Top cover [B]
A302	834430068	3TTS+6B(BC), Tapping screw
A501	27210737	Front panel [S]
	27210739	Front panel [B]
A502	833430080	3TTP+8P(BC), Tapping screw
A503	838430068	3TTB+6B(BC), Tapping screw
A504	87313006	M-3B, Toothed washer
A601	27270193	Spacer
A602	27175130	Leg
A603	834430068	3TTS+6B(BC), Tapping screw
A604	27141100A	Locking plate
A801	28322487	Knob, power [S]
	28322488	Knob, power [B]
A802	28322650	Knob, level [S]
	28322437	Knob, level [B]

REF. NO.	PART NO.	DESCRIPTION
P801	253123, 253136 or 253140	⚠ AS-UC-6#18, Power supply cord [D/WX]
	253127 or 253129	⚠ AS-CEE 250V, 2.5A, Power supply cord [G/W]
	253118	⚠ AS-SAA, Power supply cord [QA]
	728328	⚠ Power supply cord [QB]
S802	25065123	NSS-1258P, Voltage selector switch [W]
	82143006	3P+6F(BC), Pan head screw for S802 [W]
SC801	2000627	NSAS-8P583, Socket
SC802	2000581	NSAS-8P537, Socket
T801	2300167	⚠ NPT-943D, Power transformer [D]
	2300168	⚠ NPT-943G, Power transformer [G]
	2300169	⚠ NPT-943DG, Power transformer [W]
	2300170	⚠ NPT-943Q, Power transformer [Q]
U1	10498529-1	NAAR-2729-1, Main circuit pc board ass'y
U2	10498530-1	NAHP-2730-1, Headphone terminal pc board ass'y [G/Q/W]
	10508530-1A	NAHP-2730-1A, Headphone terminal pc board ass'y [D]
U7	10498536-1	NADIS-2736-1, Display pc board ass'y
U8	10498537-1	NAPS-2737-1, Power switch pc board ass'y
U9	10498554-1	NAAR-2854-1, Motor driver circuit pc board ass'y
	29360806A	Label, laser
	29360807	Label, danger [D]
	29360687	Label, class 1 [G/W/Q]
	29360811A	Label [G/W/Q]
	29360873	Label, locking plate

NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PARTS NUMBER SPECIFIED.

NOTE: [B]: Only Black model
[S]: Only Silver model
[D]: Only 120V model
[G]: Only 220V model
[W]: Only Wolrdwide model
[Q]: Only 240V model
[QA]: Only Australian model
[QB]: Only U.K. model
[WX]: Only PX model

MECHANISM EXPLODED VIEW



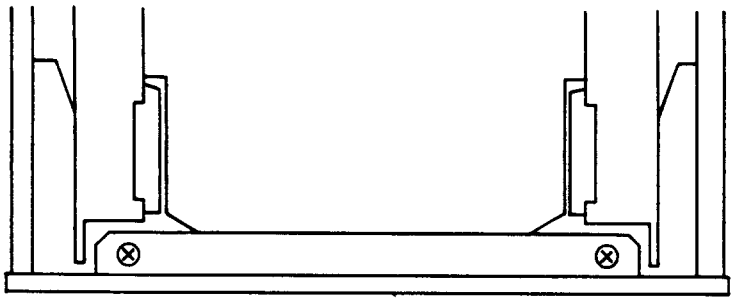
PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
1	27100098E	Chassis
3	24502203	Spindle motor
4	27300846B	Turntable platter
5	27300847A	Arm P
6	27300848A	Cap CH
7	27300849B	Holder, cap
8	27180309A	Spring
9	241065	KSS-123A, Optical pick-up
10	27260222	Shaft
11	27300850B	Rack PU
13	10498902	Shaft ass'y
16	10498903	Motor ass'y
18	27300854	Cushion rubber
19	801364	Special screw
20	82142003	2P+3F (BC), Pan head screw
21	82112605	2.6P+5F, Pan head screw
22	831430100	3TTW+10P (BC), Tapping screw
23	833420108	2TTP+10B (BC), Tapping screw
24	27180319	Spring
26	27100099D	Chassis L
28	27300855E	Arm L
29	27185019A	Roller
30	27180310B	Spring
31	27300861C	Disc tray
32	27300862E	Disc lifter L
33	27300863E	Disc lifter R
34	27180311C	Spring
35	27300856B	Cam gear
36	27300857A	Flat wheel
37	27300858	Pulley gear
39	27300860	Belt
40	10498901	Motor ass'y
41	82142604	2.6P+4F (BC), Pan head screw
42	831430100	3TTW+10P (BC), Tapping screw
43	27180320	Spring
44	833430080	3TTP+8P (BC), Tapping screw
45	833420108	2TTP+10B (BC), Tapping screw
46	27270206	Spacer
47	8930201S	ES-2S, Ring E
50	27270202	ϕ9, Spacer
51	27270203	ϕ10, Spacer
52	27141098	Bracket, holder
53	223004-1	Terminal
55	834430068	3TTS+6B (BC), Tapping screw
56	27141098	Bracket, holder
58	27270207	ϕ7, Spacer
59	27270208	ϕ4.7, Spacer
61	27180321	Roller spring
62	27180322	Guide ass'y
U3	10498544-1	NATRM-2844-1, Terminal pc board ass'y
U4	10498545-1	NASW-2845-1, Start switch pc board ass'y
U5	10498546-1	NASW-2846-1, Open switch pc board ass'y
U6	10498547-1	NASW-2847-1, Close switch pc board ass'y

DISASSEMBLING PROCEDURES

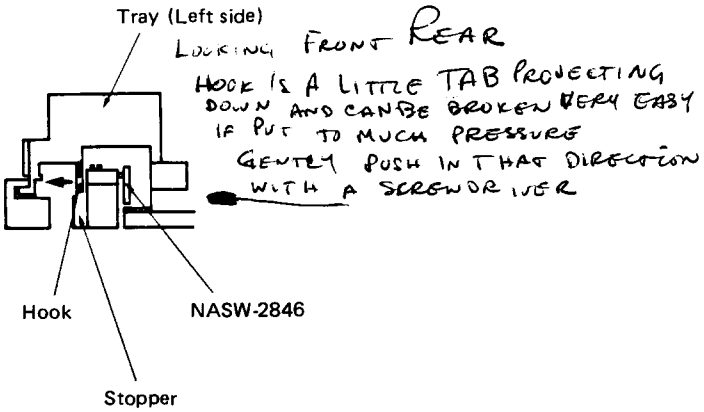
1. Tray panel removal

1) Remove the tray with pressing the OPEN/CLOSE button.
2) Turn the unit over and put it on the soft cloth.
3) Remove the two screws from the tray.



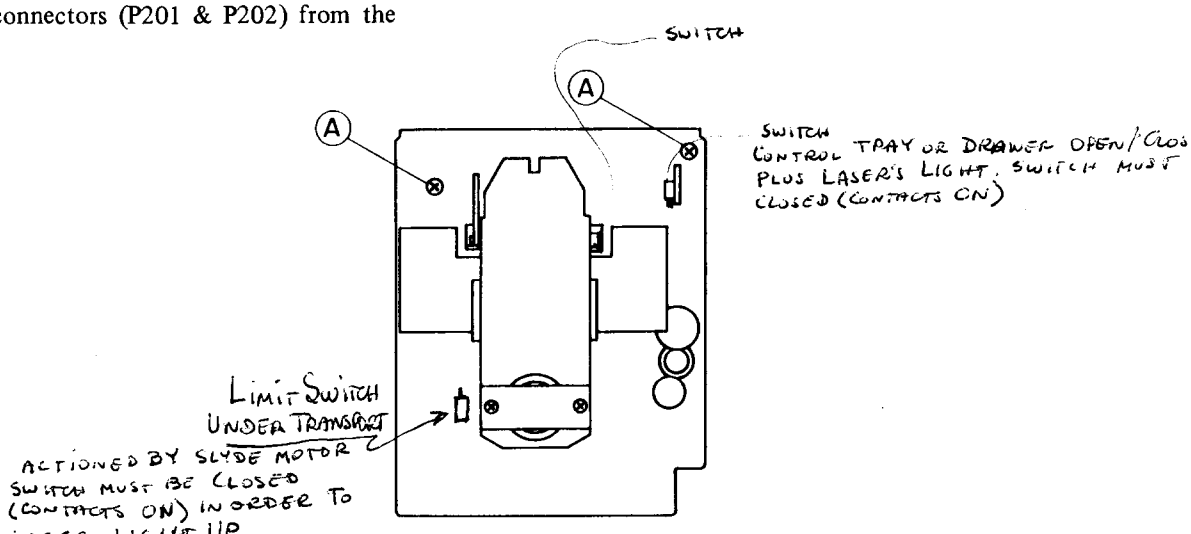
2. Tray removal

1) Remove the top cover.
2) Open the tray with pressing the OPEN/CLOSE button.
3) Release the hook of tray from stopper and pull the tray out.


Tray (Left side)
LOOKING FRONT REAR
HOOK IS A LITTLE TAB PROJECTING DOWN AND CAN BE BROKEN VERY EASY IF PUT TO MUCH PRESSURE
GENTLY PUSH IN THAT DIRECTION WITH A SCREWDRIVER
Hook
NASW-2846
Stopper

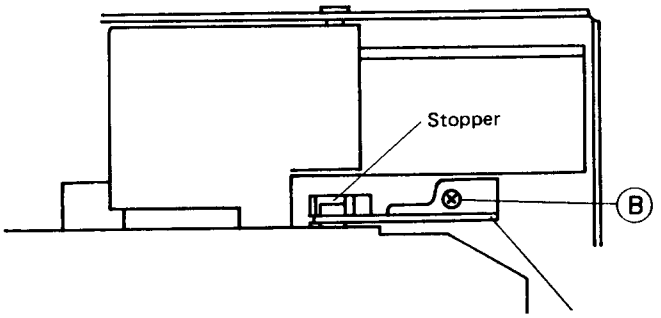
3. Mechanical chassis removal

1) Remove the top cover and tray.
2) Remove the two screws A from the mechanical chassis.
3) Remove the two connectors (P101 & P102) from the main pc board.
4) Pull the mechanical chassis out carefully.
5) Remove the two connectors (P201 & P202) from the terminal pc board.


SWITCH
A
A
SWITCH CONTROL TRAY OR DRAWER OPEN/CLOS PLUS LASER'S LIGHT. SWITCH MUST CLOSED (CONTACTS ON)
LIMIT SWITCH UNDER TRANSPORT
ACTIONED BY SLYDE MOTOR
SWITCH MUST BE CLOSED (CONTACTS ON) IN ORDER TO

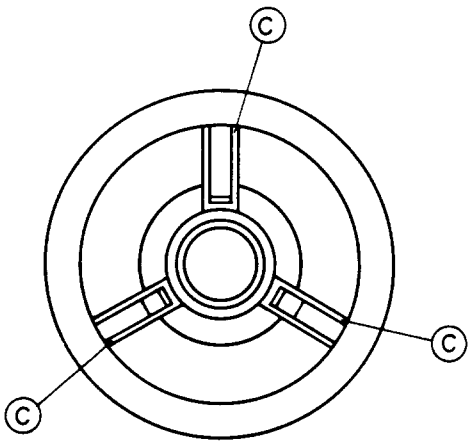
4. Arm P removal

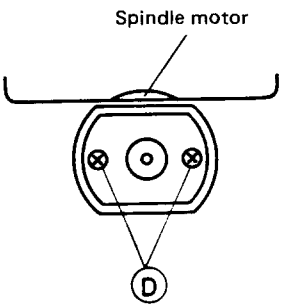
1) Remove the top cover.
2) Remove a screw B from the bracket, holder.
3) Remove the arm P from the stopper.



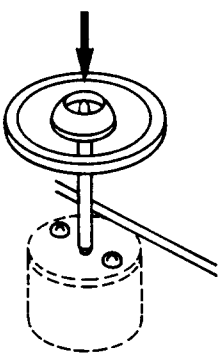
5. Replacing the spindle motor and turntable platter

1) Remove the tray and arm P.
2) Cut the points C of turntable platter with the pincers and pull it out from the shaft of spindle motor.
3) Remove the two screws D from the mechanical chassis.

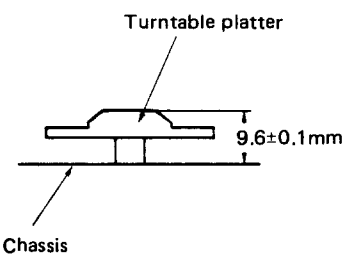




Press the center of turntable platter and insert the turntable platter in the shaft of spindle motor.

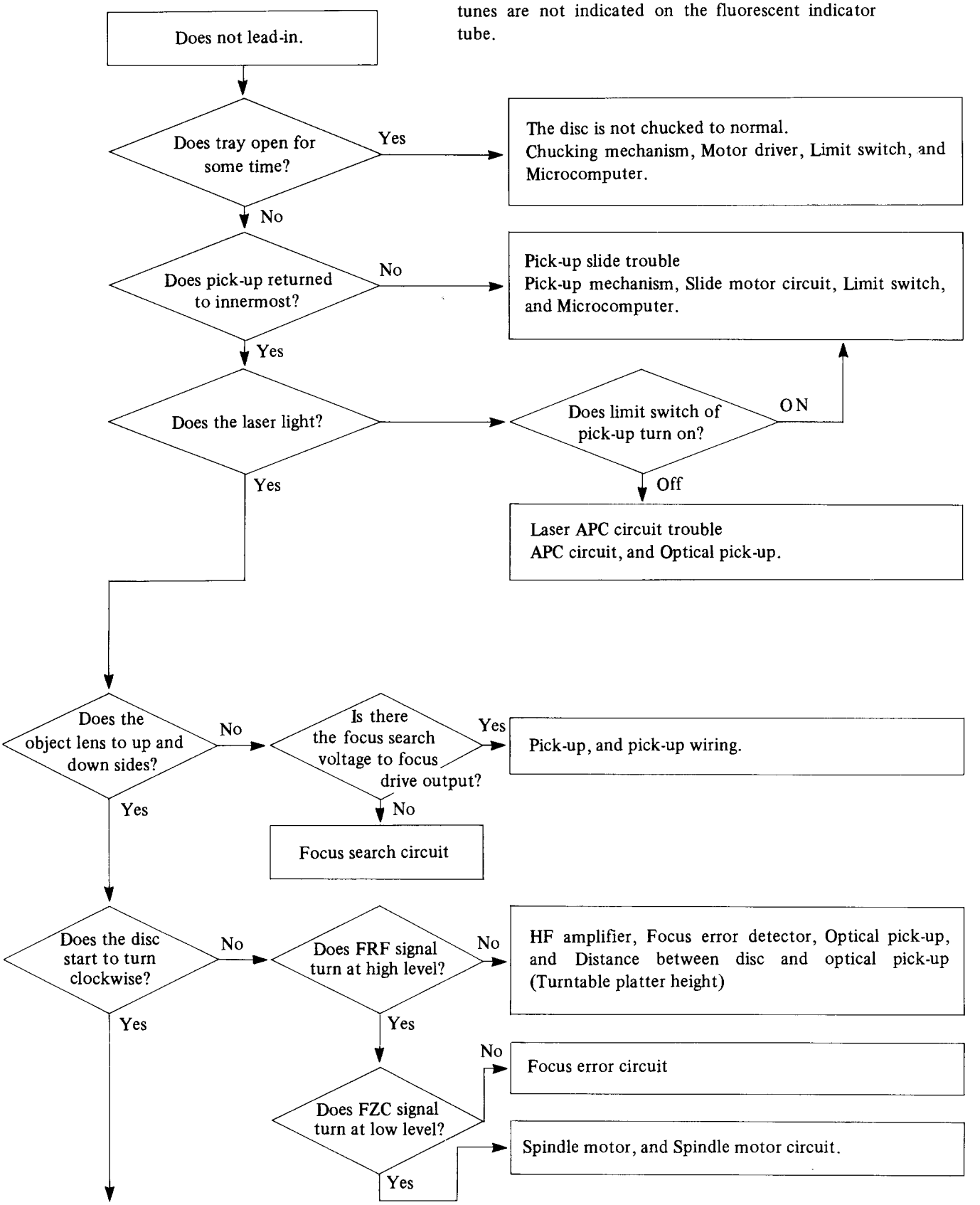


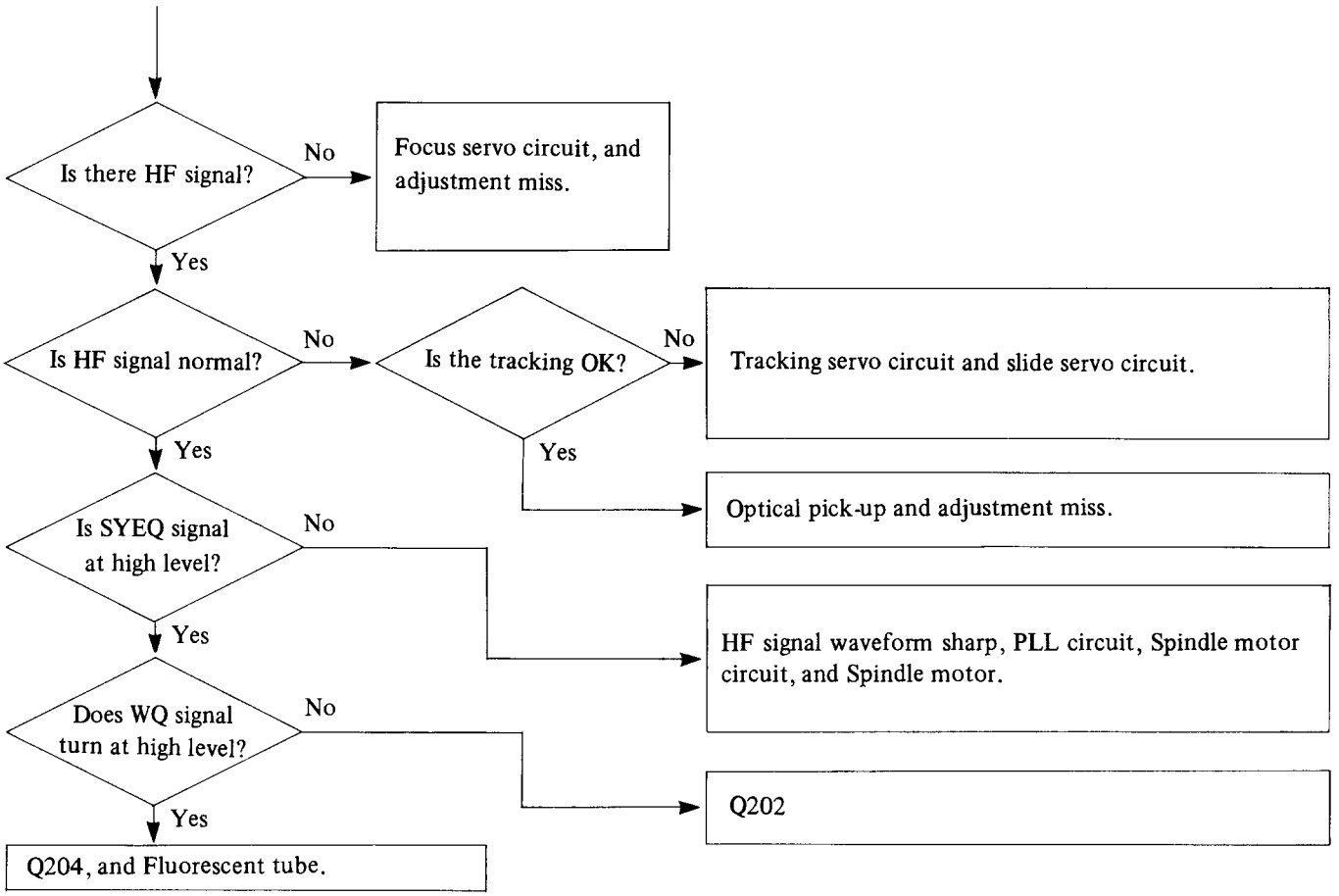
Height of turntable platter.



TROUBLE SHOOTING GUIDE

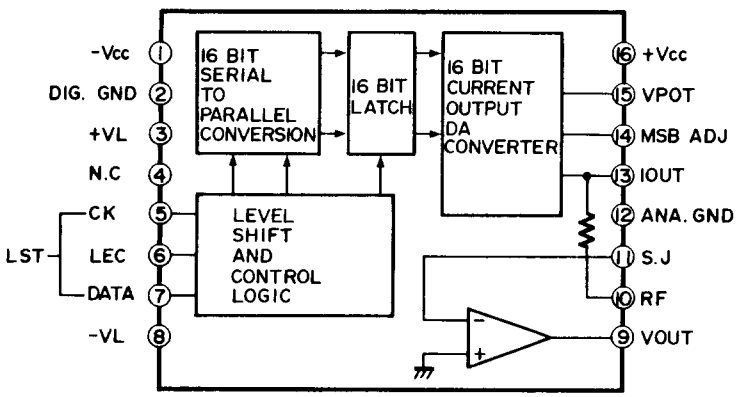
Load the disc on the tray, press OPEN/CLOSE key and close the tray. But, total play time and total number of tunes are not indicated on the fluorescent indicator tube.


Does not lead-in.
Does tray open for some time?
Yes
The disc is not chucked to normal.
Chucking mechanism, Motor driver, Limit switch, and Microcomputer.
No
Does pick-up returned to innermost?
No
Pick-up slide trouble
Pick-up mechanism, Slide motor circuit, Limit switch, and Microcomputer.
Yes
Does the laser light?
Does limit switch of pick-up turn on?
ON
Off
Yes
Laser APC circuit trouble
APC circuit, and Optical pick-up.
Does the object lens to up and down sides?
No
Is there the focus search voltage to focus drive output?
Yes
Pick-up, and pick-up wiring.
Yes
No
Focus search circuit
Does the disc start to turn clockwise?
No
Does FRF signal turn at high level?
No
HF amplifier, Focus error detector, Optical pick-up, and Distance between disc and optical pick-up (Turntable platter height)
Yes
Yes
No
Focus error circuit
Does FZC signal turn at low level?
Spindle motor, and Spindle motor circuit.
Yes



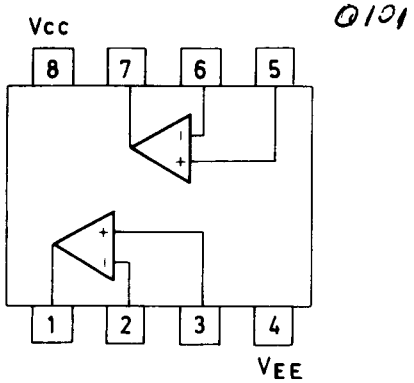
IC BLOCK DIAGRAM

PCM-56HP(D/A Converter) Q302

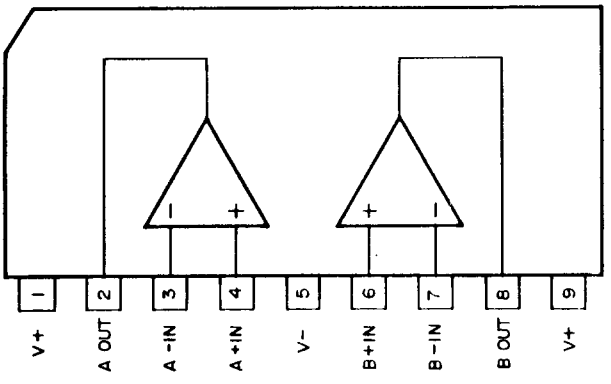


Pin No.	Designation	Function
1	–Vcc	Analog negative voltage
2	DIG GND	Digital circuit ground
3	+VL	Logic positive voltage
4	N.C	No connection
5	CK	Clock input
6	LEC	Latch enable control input
7	DATA	Data input
8	–VL	Logic negative voltage
9	Vout	Voltage output
10	RF	Feedback resistor
11	S.J	Summing junction (Op amp input)
12	ANA GND	Analog circuit ground
13	Iout	Current output
14	MSB ADJ	MSB adjustment terminal
15	VPOT	Potential meter terminal
16	+Vcc	Analog positive voltage

NJM-4558D(Operation Amplifier) Q101

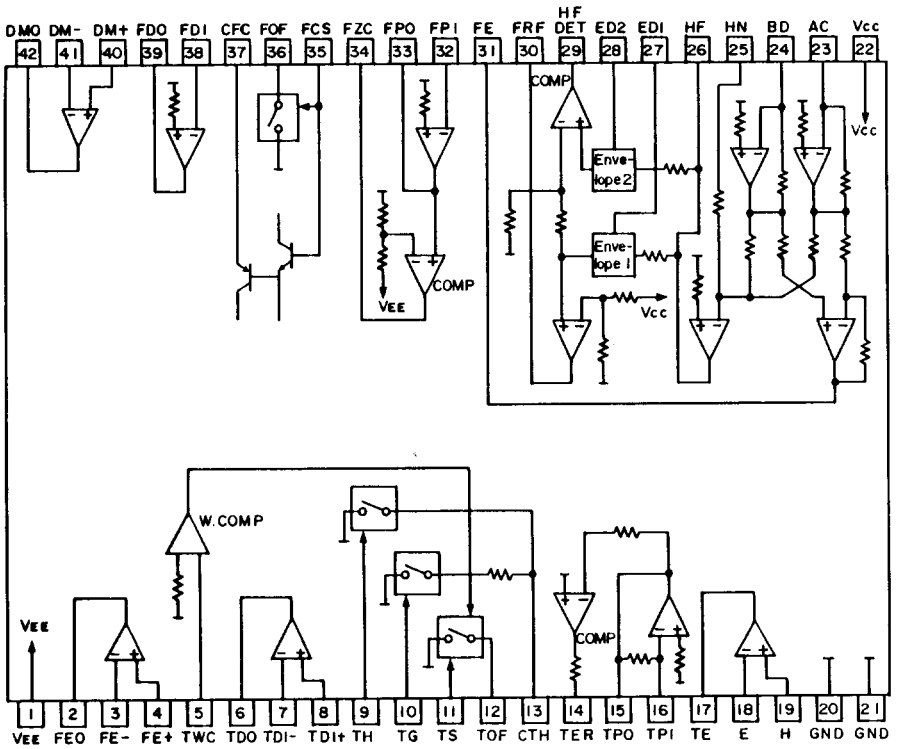


NJM-072BS(Operation Amplifier) Q309 Q310



XB087A0(Servo Linear Circuit)

Q201

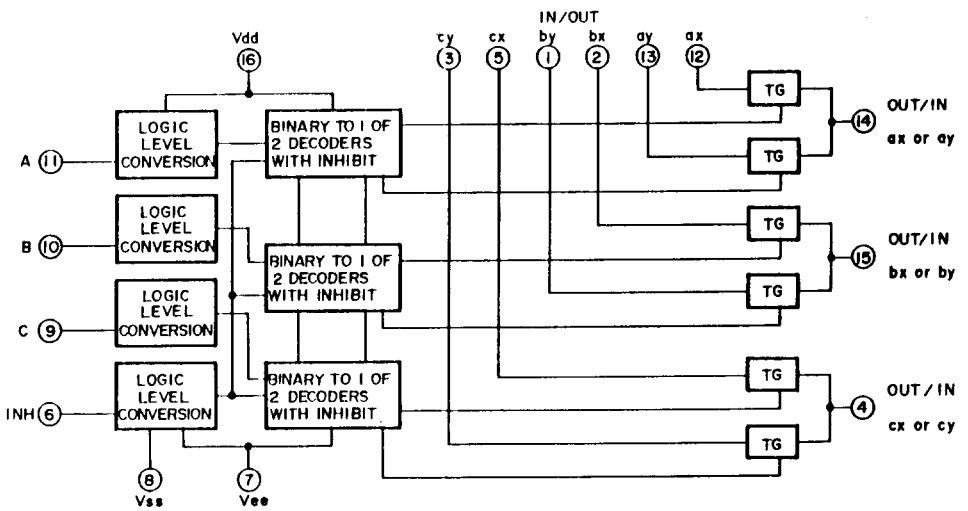

DMO DM- DM+ FDO FDI CFC FOF FCS FZC FPO FPI FE FRF HF DET ED2 EDI HF HN BD AC Vcc
42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22
COMP
Enve-lope2
Enve-lope 1
Vcc
VEE
COMP
W.COMP
COMP
VEE
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
VEE FEO FE- FE+ TWC TDO TDI- TDI+ TH TG TS TOF CTH TER TPO TPI TE E H GND GND

Pin No.	Designation	Function
2~4	FEO, FE−, FE+	Feed drive amplifier dvives the feed power amplifier and is rotated the feed motor.
5	TWC	Terminal of tracking drive limiter to tracking coil. The reference voltage of this circuit is about ±0.67V.
6~19		Tracking servo system terminals.
6~8	TDo, TDi−, TDi+	Tracking drive amplifier drives the tracking power amplifier and actuates the tracking actuator.
9~11	TH, TG, TS	Tracking jump control switches. TH: Tracking hold switch TG: Gain control switch TS: Tracking offset switch
12~13	TOF, CTH	These terminals are controlled the tracking loop by TH,TG and TS (pins 9,10,and 11).
14	TER	The output terminal of comparator of tracking zero cross.
15~16	TPo, TPi	Input/Output terminals of tracking preamplifier.
17~19	TE, E, F	This circuit is constituted by I-V conversion and differential amplifier. The reflected sub beams are converted into electric signals by the E and F, and the mutual differnces are obtained as a tracking error signal.
23~39		Focus servo system terminals.
23~24	AC, BD	Input terminals from main spot of photo diode.
25~26	HN, HF	Feedback terminal and output terminal of HF (RF) signal.
27~28	ED1, ED2	Terminals for peak hold (pin 27) and bottom hold (pin 28)of HF (RF) signal.
29, 30, 34		Output terminals of servo IC to control the focus tracking.
29	HF	HF output is L level on the track of disc and H level on mirror section.
30	FRF	This circuit is the focus servo to on when comes the focus point from focus search condition.

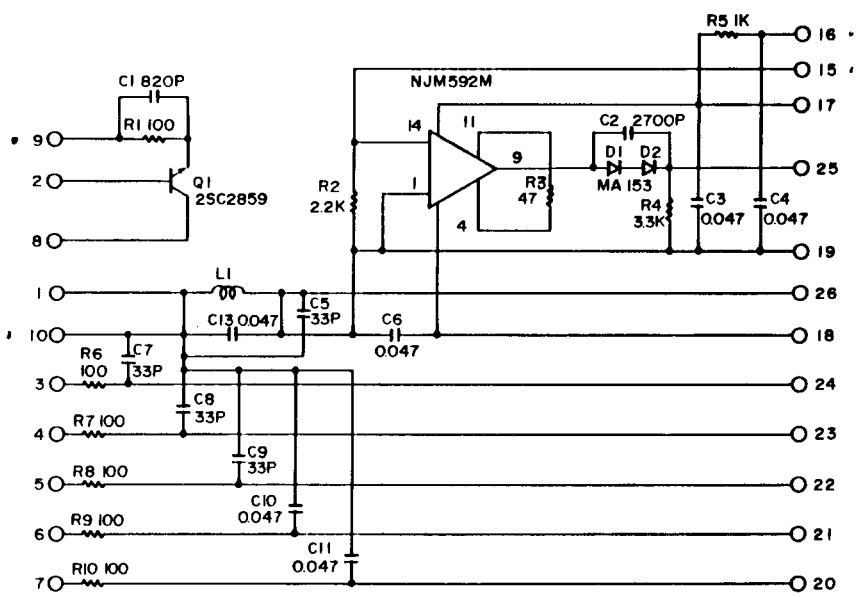
Pin No.	Designation	Function
34	FZC	Use when the focus search. Same as above.
35	FCS	Signal input terminal to pull the focus.
36	FOF	Attenuator terminal.
37	CFC	Terminal to make the ramp waveform of focus search ramp circuit.
38~39	FDi, FDo	Input/output terminals of focus drive amplifier.
40~42	DM+, DM−, DMo	Input/output terminals of disc drive amplifier.

μPD4053BC(Analog Switch)

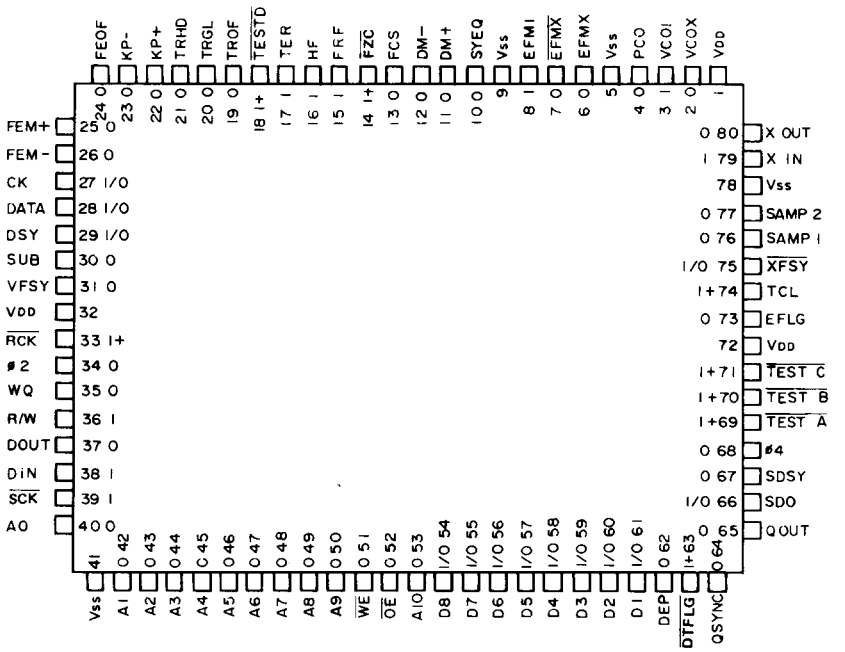
Q303



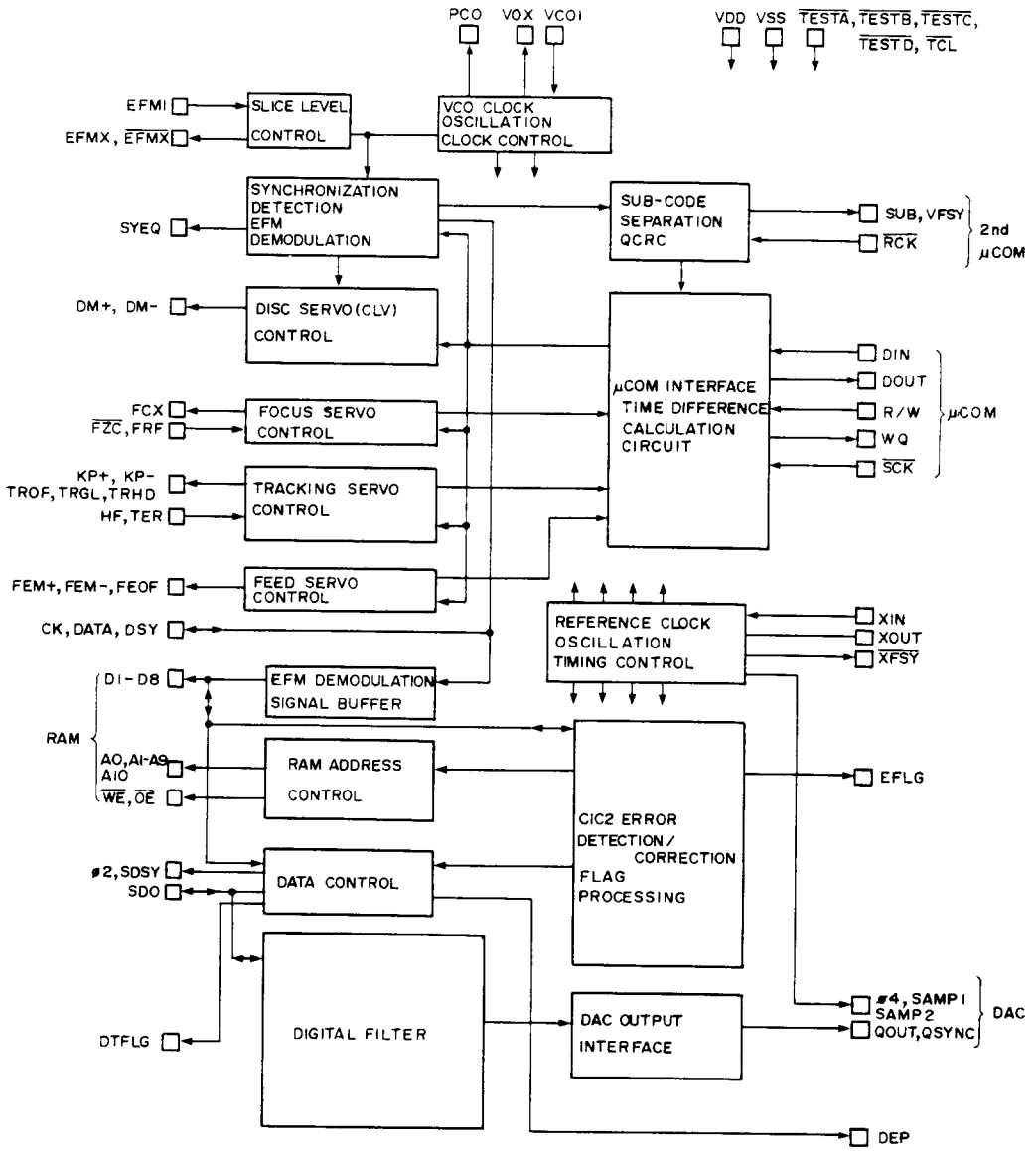
TP-1091 (Optical Divice)



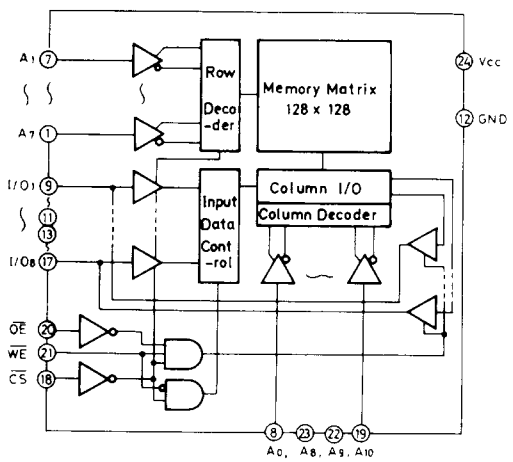
YM3815(Signal Processor & Controller)



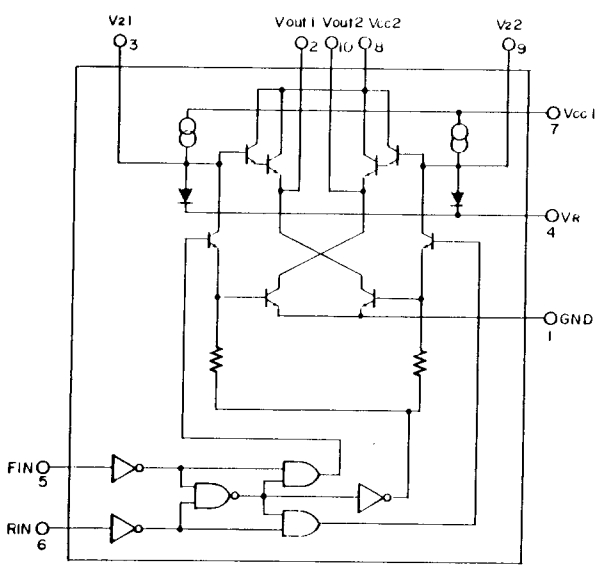
Pin No.	Designation	Function
79, 80	79 x IN and 80 x OUT	Clock Oscillator (8.6436MHz)
6~8	8 EFMI, 7 $\overline{\text{EFMX}}$, and 6 EFMX	EFM External Circuit
2~4	4 PCO, 3 VCO1, 2 VCOX	Clock Regeneration Circuit
10	SYEQ	WYNC Match Signal
27~29	27 CK, 28 DATA, and 29 DSY	FM Demondulation Signal Check Output
30, 31, 33	30 SUB, 31 VFSY, and 33 $\overline{\text{RCK}}$	Sub-code Output
35~37, 39	35 WQ, 36 R/W, 37 DOUT, and 39 $\overline{\text{SCK}}$	Q-code Output related Pins
36, 38, 39	36 R/W, 38 DIN, and 39 $\overline{\text{SCK}}$	μ COM Command related Pins
13~15	Input 14 $\overline{\text{FZC}}$ – 15 FRF, and Output 13 FCS	Focus Servo-mechanism related Pins
11, 12	11 DM+, and 12 DM–	Disc Servo-mechanism Pins
16, 17 19~23	Input 16 HF, and 17 TER Output 19 TROF, 20 TRGL, 21 TRHD, 22 KP+, and 23 KP–	Tracking Servo-mechanism related Pins
24~26	24 FEOF, 25 FEM+, and 26 FEM–	Feed Servo-mechanism related Pins
40, 42~61	40A0–53A10, 51 $\overline{\text{WE}}$, 52 $\overline{\text{OE}}$, and 54D8–61D1	RAM Connection
75	75 $\overline{\text{XFSY}}$	Crystal Clock SYNC Signal
73	73 EFLG	C1 and C2 Error Correction Check Signal
34, 66, 67 69, 71, 63	34 ϕ2, 66 SDO, SDSY, 63 DTFLG 69 $\overline{\text{TEST A}}$, and 71 $\overline{\text{TESTC}}$	DATA Control Circuit-Serial Signal Output
64, 65 68, 76, 77	65 Q OUT, 64 Q SYNC, 76 SAMP1, 77 SAMP, 2 and 68 ϕ4	DAC Interface
62	62 DEP	De-emphasis Signal
8, 18 69~71	69 $\overline{\text{TEST A}}$, 70 $\overline{\text{TEST B}}$, 71 $\overline{\text{TEST C}}$, 18 $\overline{\text{TEST D}}$, and 8 $\overline{\text{TCL}}$	Test Pins



CXK5816M-15/HM6116P-4(16bit RAM)

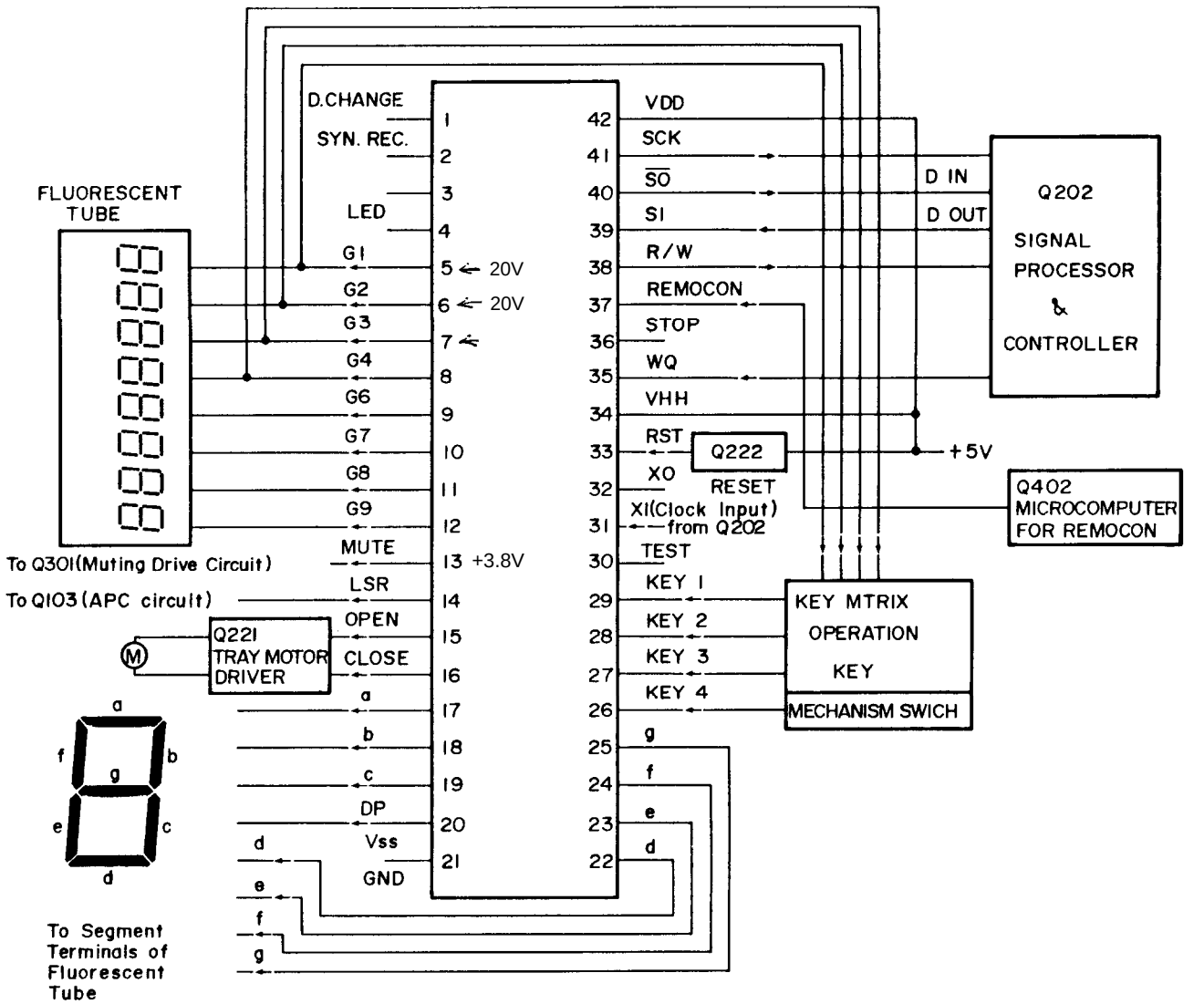


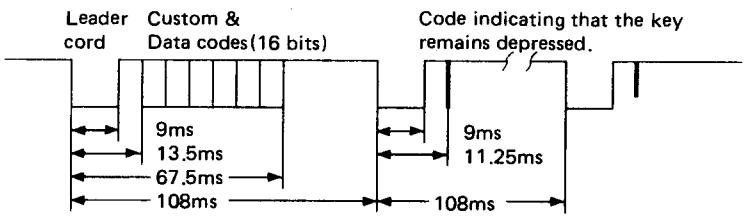
BA-6109(Motor Driver)



Connection of Micro Computer

Q204 TMP47C410AN-6078Z



Pin NO.	Terminal	Description
5~8 9~12 17~19 20 22~25	G1-G4 G6-G9 a-c DP d-g	Control of fluorescent display tube is used the dynamic driver method.The digit datas of eight figures and eight segment datas are output from microcomputer.
13	MUTE	Audio muting control output for audio muting when the disc is stopped, and during accessing operations and pause mode. Muting is applied when the output is at high level.
14	$\overline{\text{LSR}}$	Optical pick-up laser on/off control output. Laser is on when the output is at low level.
15 16	OPEN CLOSE	These signals used to control disc tray openning and closing operations. Control signals are passed direct from the microcomuter to pins 5 and 6 of the Q221 tray motor driver.
26	KEY 4	The condition of mechanical switches (open, close, and start) is processed, and data of switches is read by KEY 4 input port.
27~29	KEY 3-KEY 1	A 12(4x3) matrix is formed by using the digit datas. (Positive logic)
31	X1	Clock input from Q202.
33	RST	Using an IC designed specifically for microcomputer resetting, a reset output (low level) is applied to the microcomputer RST terminal when +5V line voltage drops below 4V reference voltage. This pin is normally switched on, and subsequently kept at high level.
37	REMOCON	Remote control input terminal. 
35	WQ	Write request: High level when transmit the information to micro computer.
38	R/W	Read/Write: High level when transmit the command from micro computer.
39	SI	Serial input: Transmit the servo system condition and sub-code data to micro computer.
40	$\overline{\text{SO}}$	Serial output: Transmit the command data from micro computer to servo system.
41	SCK	Serial clock: Clock of serial data.Data is shifted at trailing edge.

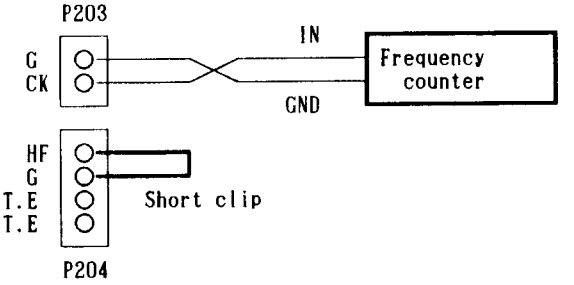
ADJUSTMENT PROCEDURES

Instruments required

Dual trace oscilloscope, Frequency counter, CR oscillator, Test disc (SONY YEDS-18 TYPE4), Short clip, Resistor 1kohm

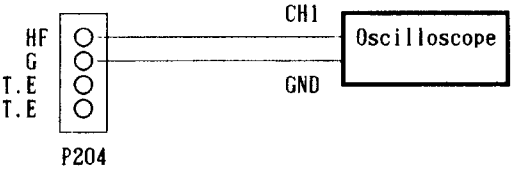
1. VCO frequency adjustment

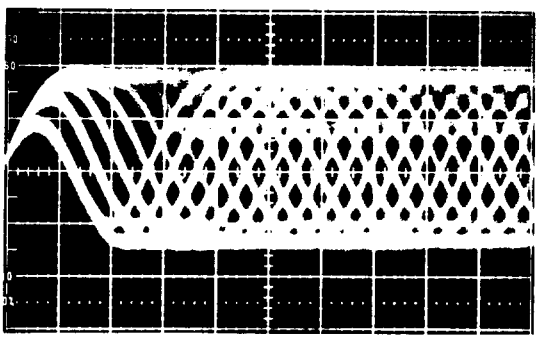
Turn the power switch to ON.
Connect the frequency counter to the pin 2 (CK) of P203.
Connect the pins 1 (HF) and 2 (GND) with the short clip.
Adjust L201 until the frequency counter reading 4.32MHz.
After adjustment, remove the frequency counter and short clip. 600mv X 10 =6Vpp (Test probe X10 setting)



2. Focus offset adjustment

Load the test disc YEDS-18 and play back the track 2.
Connect the oscilloscope to pin 1 of P204.
Set R217 to mechanical center.
Adjust R217 until a clear trace of waveform pattern as shown photo 1 appear on the oscilloscope.
After adjustment, remove the oscilloscope.



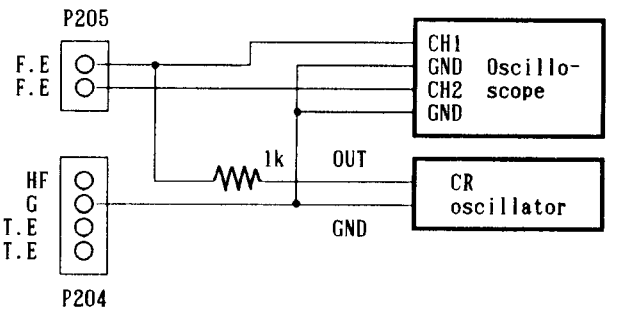


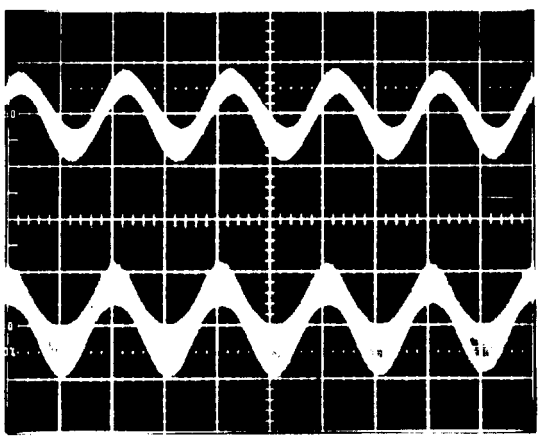
0.5V/div.
0.5μs/div.

Photo 1

3. Focus gain adjustment

Connect the dual trace oscilloscope to pins 1 (CH1) and 2 (CH2) of P205 at play condition.
Apply a sine wave 500mVp-p at 1kHz via resistor 1kohm from CR oscillator to pin 1 of P205.
Adjust R219 so that the waveforms of channel 1 and channel 2 become same level. (Refer photo 2).
After adjustment, remove the CR oscillator and oscilloscope.





A=B

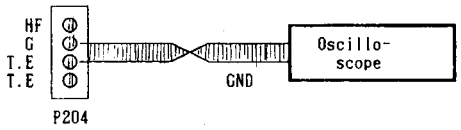
0.5V/div.
0.5ms/div.

Photo 2

Follow instruction and you can see waveform.

acking balance adjustment : Follow All Instructions In order To See Waveform.

R269 to minimum position (counter-clockwise) at condition.
ect the oscilloscope to pin 3 (TE) of P204.
st R279 until both positive and negative peaks of the form becomes equal at 0V level. (Refer photo 3)
adjustment, set R269 to mechanical center and ve the oscilloscope.



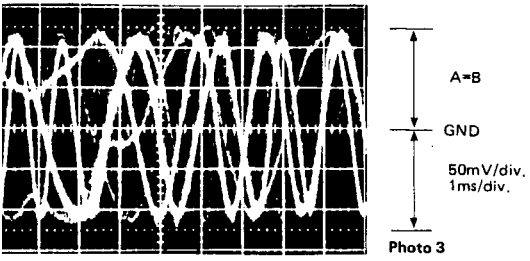
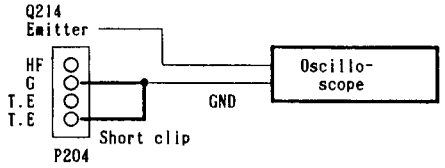


Photo 3

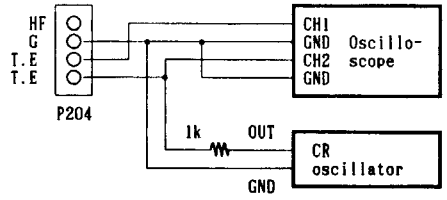
acking offset adjustment

ect the oscilloscope to the emitter of Q214 (Output of motor) at play condition.
ect the pins 4 (T.E) and 2 (GND) of P204 with the clip.
st R273 until both positive and negative peaks of the form becomes equal at 0V level.
adjustment, remove the oscilloscope and short clip.



acking gain adjustment

ect the dual trace oscilloscope to pins 3 (CH1) and 4) of P204 at play condition.
y a sine wave 1 Vp-p at 1.2kHz via resistor 1kohm CR oscillator to pin 4 of P204.
st R269 so that the waveforms of channel 1 and nel 2 become same level. (Refer photo 4).
adjustment, remove the CR oscillator and oscillo-.



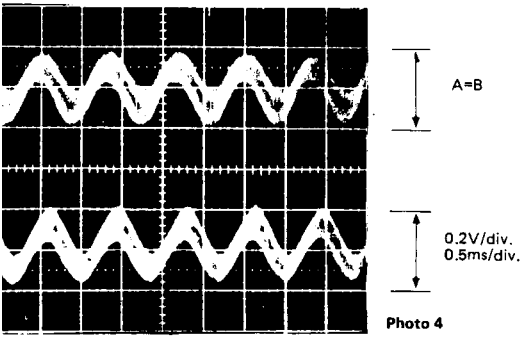


Photo 4

7. Optical coupling adjustment

Connect the oscilloscope to test point DATA.
Turn R301 to minimum position (counter-clockwise).
Load the test disc (YEDS-18) and play back the track 2.
Adjust R301 so that a point of inter section of waveform DATA becomes 2.5V.

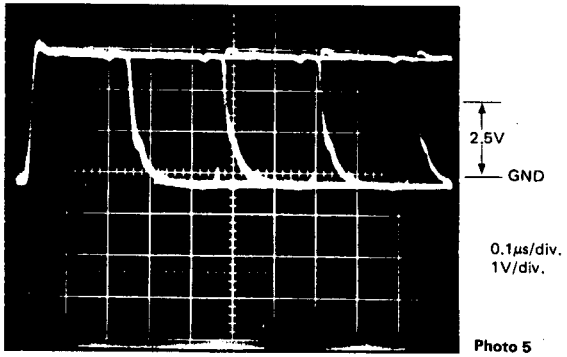
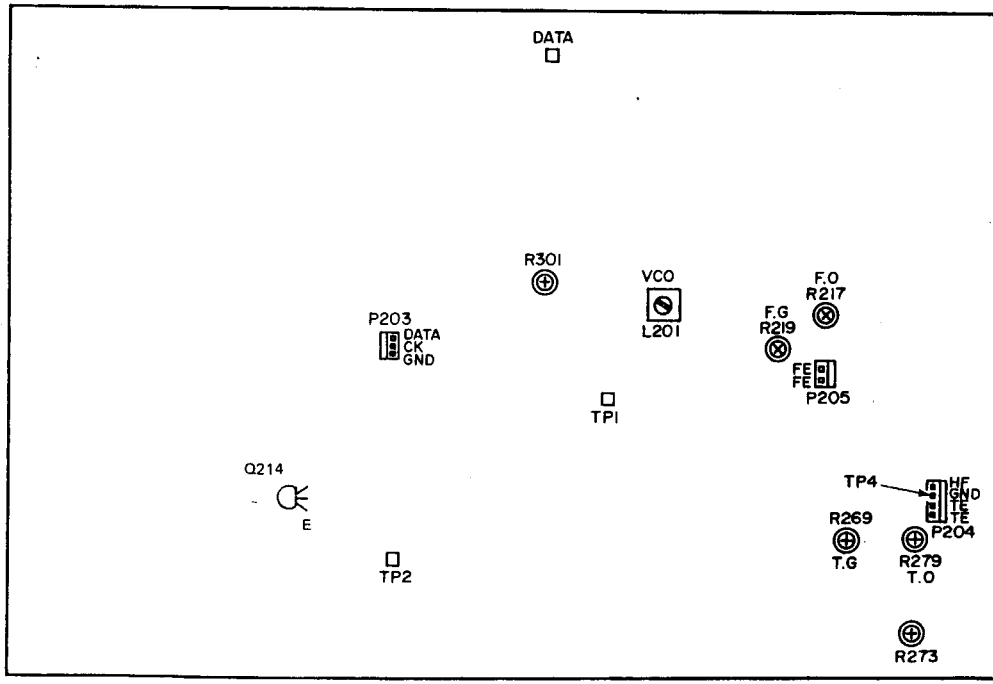
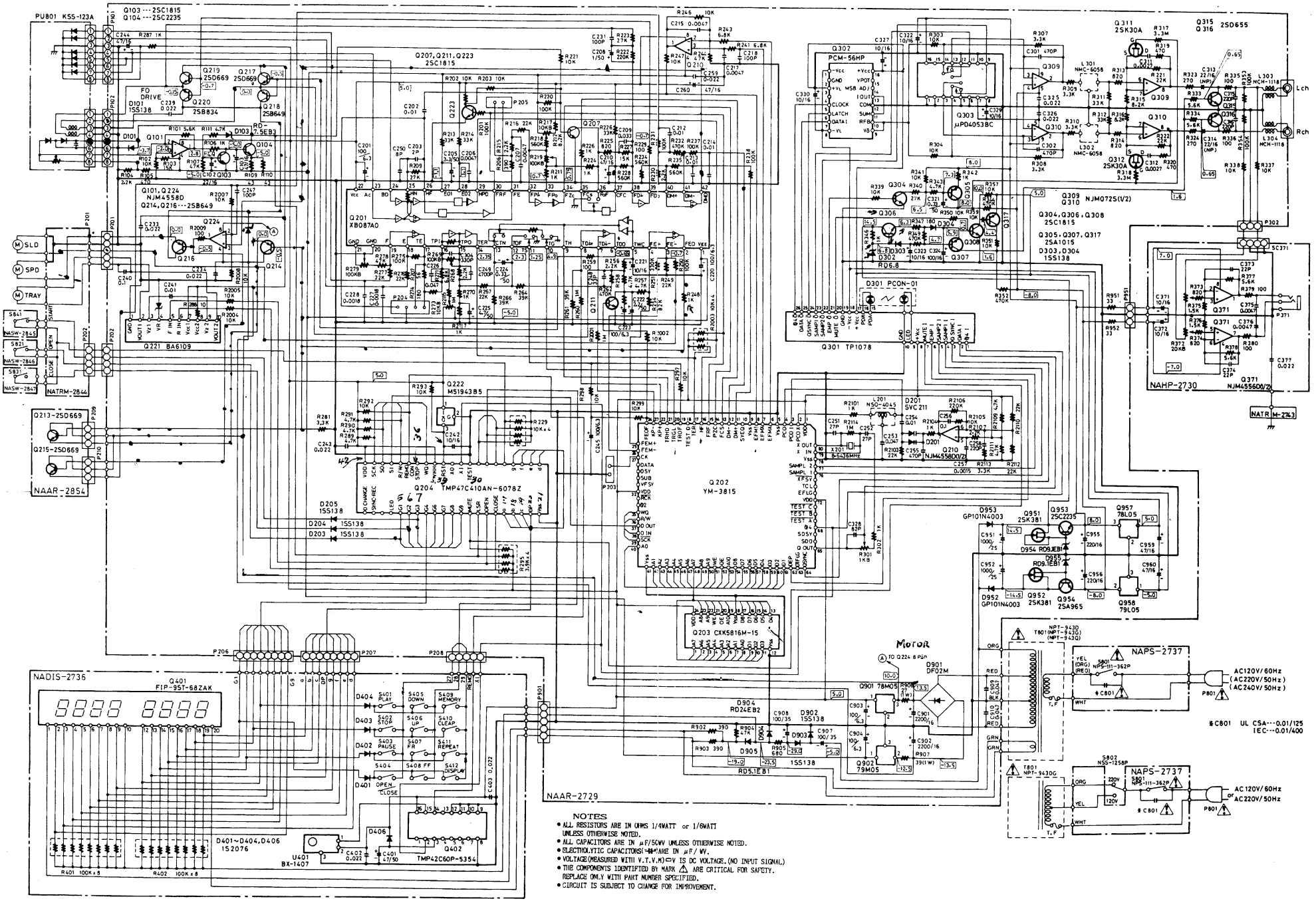


Photo 5



Adjustment Point

SCHEMATIC DIAGRAM



NOTES

- ALL RESISTORS ARE IN OHMS 1/4WATT or 1/6WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF/50WV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS(—⊕)ARE IN μF/WV.
- VOLTAGE(MEASURED WITH V.T.V.M)⊖V IS DC VOLTAGE.(NO INPUT SIGNAL)
- THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR SAFETY. REPLACE ONLY WITH PART NUMBER SPECIFIED.
- CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT.

PRINTED CIRCUIT BOARD-PARTS LIST

MAIN CIRCUIT PC BOARD(NAAR-2729-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
	ICs	
Q101, Q210	222465	NJM4558D
Q201	222984	XBO87AO
Q202	222985	YM-3815
Q203	222990 or	CXK5816M-15 or
	222882	HM6116FP-4
Q204	222986	TMP47C410AN-6078Z
Q221	222894	BA6109
Q222	222951	M51943BS
Q224	222465	NJM4558D
Q301	222058	TP1091
Q302	222988	PCM-56HP
Q303	222717	μPD4053BC
Q309, Q310	22240010	NJM072BS
Q901	222780052	78M05
Q902	222790052	79M05
Q957	222780053	78L05
Q958	222790053	79L05
	Transistors	
Q103, Q207	2211254 or	2SC1815(Y) or
Q211, Q223	2211255	2SC1815(GR)
Q104	2211653 or	2SC2235(O) or
	2211654	2SC2235(Y)
Q214, Q216	2200793 or	2SB649(C) or
	2200794	2SB649(D)
Q217, Q219	2200783 or	2SD669(C) or
	2200784	2SD669(D)
Q218	2200793 or	2SB649(C) or
	2200794	2SB649(D)
Q220	2201243 or	2SB834(O) or
	2201244	2SB834(Y)
Q304, Q306	2211254 or	2SC1815(Y) or
Q308	2211255	2SC1815(GR)
Q305, Q307	2211454 or	2SA1015(Y) or
Q317	2211455	2SA1015(GR)
Q311, Q312	2212375	2SK30ATM(GR)
Q315, Q316	2211705 or	2SD655(E) or
	2211706	2SD655(F)
Q951, Q952	2212303,	2SK381(C),
	2212304,	2SK381(D),
	2211944 or	2SK246(Y) or
	2211945	2SK246(GR)
Q953	2211653 or	2SC2235(O) or
	2211654	2SC2235(Y)
Q954	2211643 or	2SA965(O) or
	2211644	2SA965(Y)
	Diodes	
D101	223155	1SS138
D103	2239533 or	RD7.5EB3 or
	2243183	MTZ7.5C
D201	225181	SVC211, Variable capacitor
D202	2239571 or	RD9.1EB1 or
	2243201	MTZ9.1A
D203-D205	223155	1SS138
D206	2243431 or	RD3.0F-B1 or
	2243432	RD3.0F-B2
D302	2239513 or	RD6.8EB3 or
	2243173	MTZ6.8C
D303, D304	223155	1SS138
D901	223892	DF02M
D902, D903	223155	1SS138
D904	2243302 or	MTZ24B or
	2239772	RD24EB2
D905	2243141 or	MTZ5.1A or
	2239451	RD5.1EB1
D952, D953	223880	GP101N4003
D954, D955	2239751 or	RD9.1EB1 or
	2243201	MTZ9.1A

CIRCUIT NO.	PART NO.	DESCRIPTION
	Photocoupler	
D301	225234	PCON-01 (C)
	X'tal	
X201	3010084	KD3492D-A
	Coils	
L201	232129	NSO-4045
L301, L302	232131-1	NMC-6058
L303, L304	231066	NCH-1118
	Capacitors	
C102	354742209	22μF, 16V, Elect.
C103	354744709	47μF, 16V, Elect.
C201	354721019	100μF, 6.3V, Elect.
C205	354780339	3.3μF, 50V, Elect.
C208	354780109	1μF, 50V, Elect.
C210	354744709	47μF, 16V, Elect.
C211	354780109	1μF, 50V, Elect.
C220	354721019	100μF, 6.3V, Elect.
C221	354741009	10μF, 16V, Elect.
C222	354780229	2.2μF, 50V, Elect.
C223	354744709	47μF, 16V, Elect.
C224	354783399	0.33μF, 50V, Elect.
C225	354780479	4.7μF, 50V, Elect.
C242	354780109	1μF, 50V, Elect.
C244	354744709	47μF, 16V, Elect.
C245	354721019	100μF, 6.3V, Elect.
C260	354744709	47μF, 16V, Elect.
C301, C302	372524714	470pF ±5%, 50V, Styrol
C313, C314	352942206	22μF, 16V, Non-polar elect.
C315, C316	372522214	220pF ±5%, 50V, Styrol
C321	354783399	0.33μF, 50V, Elect.
C322, C323	354741009	10μF, 16V, Elect.
C324	354741019	100μF, 16V, Elect.
C327	354741009	10μF, 16V, Elect.
C329, C330	354741009	10μF, 16V, Elect.
C901, C902	354742229	2,200μF, 16V, Elect.
C903, C904	354721019	100μF, 6.3V, Elect.
C907, C908	354761019	100μF, 35V, Elect.
C951, C952	354751029	1,000μF, 25V, Elect.
C953, C954	354741019	100μF, 16V, Elect.
C955, C956	354742219	220μF, 16V, Elect.
C959, C960	354744709	47μF, 16V, Elect.
	Resistors	
R217, R273	5210064	N06HR103BD, Semi-fixed
R219, R269	5210070	N06HR104BD, Semi-fixed
R279	5210070	N06HR104BD, Semi-fixed
R294	49163103404	10kohmx4, 1/10W, Network
R295	49163392404	3.9kohmx4, 1/10W, Network
R2003	49163103404	10kohmx4, 1/10W, Network
R301	5210007	N06HR1KBDM, Semi-fixed
R907	441623904	39ohm, 1W, Metal oxide film
R908	441622704	27ohm, 1W, Metal oxide film
	Plugs	
P101	25055153	NPLG-9P-137 2000627
P102	25055152	NPLG-8P-136
P203	25055146	NPLG-2P-130
P204	25055148	NPLG-4P-132
P205	25055146	NPLG-2P-130
P302	25055133	NPLG-3P-117
	Sockets	
SC201	2000444	NSAS-5P-403
SC202	2000583	NSAS-4P-539
P206, P207	25050272	NSCT-8P-100

CIRCUIT NO.	PART NO.	DESCRIPTION
P208, P901	25050269	NSCT-5P-97
P951	25050267	NSCT-3P-95
	Terminal	
P301	25045180	NPJ-2PDBL70, Output
	Radiator	
	27160029	RAD-07
	Bracket	
	27141059	Ground
	Screw	
	82143006	3P+6FN(BC)

HEADPHONE AMPLIFIER PC BOARD (NAHP-2730-1/1A)

CIRCUIT NO.	PART NO.	DESCRIPTION
Q371	222654	NJM4556D, IC
C371, C372	354741009	10μF, 16V, Elect. capacitor
R371, R372	5104172	N09RGL20KB15, Variable resistor
P371	25045139	HLJ0540-01-010, Headphone terminal
SC371	2000538B	NSAS-3P494, Socket

DISPLAY PC BOARD(NADIS-2736-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
U401	241068	BX-1407, Photo receiving unit, remote control
Q401	212034	FIP9ST-68ZAK, Fluorescent indicator tube
Q402	222989	TMP42C60P-5354, IC
D401-D404	223145 or	1S2076 or
D406	223150	US-1040, Diodes
C401	354780479	4.7μF, 50V, Elect.capacitor
R401, R402	49121104408	100kohmx8, 1/8W, Network resistor
S401-S412	25035389	NPS-111-S353, Push switches
	28140501	t4.5x10x40mm, Cushion

POWER SWITCH PC BOARD(NAPS-2737-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
C801	3500065A	⚠ DE7150FZ103PCSA, Capacitor IS
S801	25035398	⚠ NPS-111-S362P, Power switch
	27300601	⚠ Cover for C801
	25060092	NTM-1S33, Terminal

TERMINAL PC BOARD(NATRM-2844-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
P201	25055135	NPLG-5P-119, Plug
P202	25055148	NPLG-4P-132, Plug
	25060092	Terminals

SWITCH PC BOARDS (NASW-2845-1/2846-1/2847-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
S841	25065261	NMS-1212, Microswitch, start
S821	25065260	NMS-1211, Microswitch, open
S831	25065261	NMS-1212, Microswitch, close

MOTOR DRIVER CIRCUIT PC BOARD (NAAR-2854-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
Q213, Q215	2200783 or	2SD669(C) or
	2200784	2SD669(D), Transistors
P209, P210	25050267	NSCT-3P95, Sockets
	27160029	RAD-07, Radiators
	82143006	3P+6FN(BC), Pan head screws